AGENCY OF NATURAL RESOURCES
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION
ONE NATIONAL LIFE DRIVE, DAVIS BUILDING, 3rd FLOOR
MONTPELIER, VT 05620-3522

FACT SHEET FOR PERMIT
June 2025
Revised July 2025

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT TO DISCHARGE TO WATERS OF THE STATE

PERMIT NO: 3-1588
NPDES NO: VT0120133

NAME AND ADDRESS OF APPLICANT:

Town of Franklin
P.O. Box 82
Franklin, VT 05457

NAME AND ADDRESS OF FACILITY WHERE DISCHARGE OCCURS:

Lake Carmi, various locations

FACILITY COORDINATES: Lat: 44.97232 Long: -72.87554 .

RECEIVING WATERS: Lake Carmi

CLASSIFICATION: All uses Class B(2). Class B waters are suitable for swimming and other primary contact recreation; irrigation and agricultural uses; aquatic biota and aquatic habitat; good aesthetic value; boating, fishing, and other recreational uses; and suitable for public water source with filtration and disinfection or other required treatment.

I. Proposed Action, Type of Facility, and Discharge Location

The Secretary of the Vermont Agency of Natural Resources (hereinafter referred to as "the Secretary") received an application for the permit to discharge into the designated receiving water from The Town of Franklin on January 27, 2025. At this time, the Secretary has made a tentative decision to issue the discharge permit.

II. Description of Discharge

The discharge consists of a mixture of aluminum sulfate and sodium aluminate (hereinafter referred to as “alum”) discharged to the to the lake from boats. The intent is to bind and immobilize phosphorus in the water column and on the lake bottom to reduce the release of phosphorus from the sediment into the hypolimnion. This treatment is intended to mitigate cyanobacterial blooms that are affecting the designated uses of Lake Carmi.

III. Limitations and Conditions

The permit contains effluent limitations for aluminum, and turbidity. It also contains monitoring requirements for pH, hardness, dissolved organic carbon (DOC), temperature, phosphorus and flow. Visual monitoring for adverse impacts to biota are also required. The effluent limitations of the draft permit and the monitoring requirements may be found on pages 2-11 of the draft permit.

IV. Statutory and Regulatory Authority

A. Clean Water Act and NPDES Background

The Clean Water Act (CWA or Act) was enacted “to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.” CWA § 101(a). To achieve this objective, the CWA makes it unlawful for any person to discharge any pollutant into the waters of the United States from any point source, except as authorized by specified permitting sections of the Act, one of which is § 402. CWA §§ 301(a), 402(a). Section 402 establishes one of the CWA's principal permitting programs, the National Pollutant Discharge Elimination System (NPDES). Under this section of the Act, the U.S. Environmental Protection Agency (EPA) may “issue a permit for the discharge of any pollutant, or combination of pollutants” in accordance with certain conditions. CWA § 402(a). The State of Vermont has been approved by the EPA to administer the NPDES Program in Vermont. NPDES permits generally contain discharge limitations and establish related monitoring and reporting requirements. CWA § 402(a)(1) - (2).

Section 301 of the CWA provides for two types of effluent limitations to be included in NPDES permits: “technology-based” limitations and “water quality-based” limitations. CWA §§ 301, 303, 304(b); 40 C.F.R. Parts 122, 125, 131. Technology-based limitations, generally developed on an industry-by-industry basis, reflect a specified level of pollutant-reducing technology available and economically achievable for the type of facility being permitted. CWA § 301(b). As a class, WWTFs must meet performance-based requirements based on available wastewater treatment technology. CWA § 301(b)(1)(B). The performance level for WWTFs is referred to as “secondary treatment.” Secondary treatment is comprised of technology-based requirements expressed in terms of BOD_5, TSS, and pH; 40 C.F.R. Part 133.

Water quality-based effluent limits are designed to ensure that state water quality standards are achieved, irrespective of the technological or economic

considerations that inform technology-based limits. Under the CWA, states must develop water quality standards for all water bodies within the state. CWA § 303. These standards have three parts: (1) one or more "designated uses" for each water body or water body segment in the state; (2) water quality "criteria," consisting of numerical concentration levels and/or narrative statements specifying the amounts of various pollutants that may be present in each water body without impairing the designated uses of that water body; and (3) an antidegradation provision, focused on protecting high quality waters and protecting and maintaining water quality necessary to protect existing uses. CWA § 303(c)(2)(A); 40 C.F.R. § 131.12.

The Vermont Water Quality Standards (VWQS) define designated uses and narrative and numeric criteria for Vermont surface waters. The most recent version of the VWQS accepted by US EPA Region 1 are the basis for water quality-based effluent and receiving water limits in this permit and can be found here: https://www.epa.gov/wqs-tech/water-quality-standards-regulations-vermont.

According to 40 C.F.R. § 122.44(d)(1), NPDES permits must include effluent limitations for all pollutants that are or may be discharged at levels that have reasonable potential to cause or contribute to an exceedance of a state's water quality standards, including narrative and numeric criteria. Effluent limitations are developed to ensure that the discharge will comply with applicable criteria and to protect the designated uses of the receiving water.

Receiving stream requirements are established according to numerical and narrative standards adopted under state law for each stream classification. When using chemical-specific numeric criteria from the State's water quality standards to develop permit limits, both the acute and chronic aquatic life criteria are used and expressed in terms of maximum allowable instream pollutant concentrations. Acute aquatic life criteria are generally implemented through maximum daily limits and chronic aquatic life criteria are generally implemented through average monthly or average weekly limits.

Where reasonable potential has been established for a pollutant, but there is no numeric water quality criterion for the pollutant, the permitting authority must establish effluent limitations in one of three ways: (1) based on a calculated numeric criterion which the permitting authority demonstrates will comply with the applicable narrative criterion, such as a proposed state criterion or a policy for interpreting the narrative criterion; (2) using CWA § 304(a) recommended water quality criteria, supplemented as necessary by other relevant information; or, (3) in certain circumstances, based on an indicator parameter for the pollutant of concern.

The state rules governing Vermont's NPDES permit program are found in the Vermont Water Pollution Control Permit Regulations (Environmental Protection Rule, Chapter 13).

B. Reasonable Potential Determination

In determining whether the Applicant has reasonable potential to cause or contribute to an exceedance of the VWQS, The Department of Environmental Conservation (DEC) reviewed:

- Available effluent data collected by the permittee,
- Receiving water data collected by the DEC's Lakes and Ponds Program, and
- Available dilution in the receiving water.

For most pollutants, DEC models discharge conditions using the steady-state mass balance approach described in EPA's Technical Support Document for Water Quality-Based Toxics Control (TSD).

The Reasonable Potential Determination Memorandum for the facility is provided in Attachment A.

C. Anti-Backsliding

Section 402(o) of the CWA provides that certain effluent limitations of a renewed, reissued, or modified permit must be at least as stringent as the comparable effluent limitations in the current permit. EPA has also promulgated anti-backsliding regulations which are found at 40 C.F.R. § 122.44(l). Unless applicable anti-backsliding exemptions are met, the limits and conditions in the reissued permit must be at least as stringent as those in the current permit.

V. Description of Receiving Water

The receiving water for this discharge is Lake Carmi, which is a Class B(2) water and designated as Warm Water Fish Habitat.

VI. Mixing Zones

A Mixing Zone is a length or area within Class B waters required for the dispersion and dilution of waste discharges adequately treated to meet federal and state treatment requirements and within which it is recognized that specific water uses or water quality criteria associated with the assigned classification for such waters may not be realized. A mixing zone shall not extend more than 200 feet from the point of discharge and must meet the terms of 10 V.S.A. § 29A-204. For a mixing zone to applicable to a discharge it must be authorized within the discharge permit.

This permit establishes a mixing zone for Total Aluminum extending from the treatment system discharge point to the lake bottom and 200 feet in all lateral directions. This allows for the aluminum to mix at the treatment system discharge point and disperse into the water column as needed to bind with suspended phosphorus.

VII. Facility History and Background

This is a new permit for discharge of aluminum sulfate and sodium aluminate (alum) to address a phosphorus-driven impairment in Lake Carmi. Lake Carmi has experienced high phosphorus concentrations resulting in persistent late summer algae blooms,

reduced water clarity and heavy aquatic plant growth. In 2008, the Department of Environmental Conservation (DEC) listed Lake Carmi as “impaired” by phosphorus and per CWA Section 303(d), prepared a Total Maximum Daily Load analysis. Since the EPA approved a Total Maximum Daily Load (TMDL) in 2009, the Vermont Agency of Natural Resources (ANR) and Agency of Agriculture have worked together with the Franklin Watershed Committee and other partners to reduce nonpoint sources of phosphorus in the watershed. Despite this ongoing work in the watershed, algae and cyanobacteria blooms in the lake continue to persist in summer and fall, mainly due to internal phosphorus loading from lake sediments.

In 2019, an aeration system was installed in Lake Carmi, with the goal of reducing internal phosphorus loading by eroding the thermal stratification in the lake. This was intended to result in increased oxygen in bottom waters, oxidation of iron and manganese compounds in the bottom water, and as a result the immobilization of phosphorus stored in the sediments. In some respects, the aeration system performed as intended. When on, it was usually able to remove thermal stratification in the water column, introducing at least some dissolved oxygen down to the deep waters and maintaining concentrations above 2 ug/L at 9 m depth, which was the stated target. That being said, the system was not able to effectively reduce surface water phosphorus concentrations or cyanobacteria blooms, and seems to have had the opposite effect. Therefore, the aeration system was not operated in 2024 and removed in 2025.

Given the long-standing phosphorus enrichment, internal loading from sediment, and the listing status of the lake, the applicant seeks to mitigate these issues through a controlled application of alum.

As this is a new discharge, compliance with the Vermont Discharge Policy and Antidegradation Procedure are documented below.

A. Discharge Policy

(1) The proposed discharge is in conformance with all applicable provisions of the Vermont Water Quality Standards, including the classification of the receiving waters adopted by the Secretary as set forth in Appendix F of these rules.

The proposed permit requires the application of alum (considered the discharge) to be controlled in a manner that ensures the VWQS for all constituents other than aluminum are met in the water column and VWQS for aluminum are met at the edge of the 200ft mixing zone throughout treatment. The treatment is being completed for Lake Carmi to address phosphorus impairment.

(2) There is neither an alternative method of waste disposal, nor an alternative location for waste disposal, that would have a lesser impact on water quality including the quality of groundwater, or if there is such an alternative method or location, it would be clearly unreasonable to require its use.

This permit does not authorize a discharge of waste disposal but rather enables the use of alum to treat internal phosphorus cycling. The applicant examined the use of additional watershed controls alone, aeration, dredging, and hydrogen peroxide

treatment, and determined alum to be the most appropriate given its common use for reducing internal phosphorus cycling.

(3) The design and operation of any waste treatment or disposal facility is adequate and sufficiently reliable to ensure the full support of uses and to ensure compliance with these rules and with all applicable state and federal treatment requirements and effluent limitations.

The permit authorizes the discharge of alum from a barge system constructed for this purpose and conforming to industry standards for lake treatment for internal loading of phosphorus. Compliance with the proposed permit limits, and the preparation and approval of an Operations, Management and Emergency Response Plan will ensure that the effluent does not negatively impact any uses of the lake, and that any unpermitted impacts are fully and quickly mitigated. Any violations of the VWQS, effluent limits or observed impacts to nearby biota will require that the discharge immediately cease and that a plan to address any such impacts be developed and approved prior to resuming the discharge.

(4) Except as provided for in 10 V.S.A. § 1259(d) and (f), the discharge of wastes other than nonpolluting wastes and stormwater runoff is prohibited in Class A(1) and A(2) waters regardless of the degree of treatment provided.

Not Applicable – discharge is to a class B water.

(5) Except as provided for in 10 V.S.A. § 1259, the discharge of wastes that, prior to treatment, contained organisms pathogenic to human beings into waters is prohibited.

Not Applicable.

(6) The receiving waters will have sufficient assimilative capacity to accommodate the proposed discharge.

Compliance with turbidity limits is required, and the concentration of aluminum is limited to meet the acute and chronic aluminum criteria in the water column. The complete assimilative capacity for aluminum is being permitted due to the temporary nature of the discharge and to address the documented phosphorus impairment. There are no other known discharges of aluminum to the lake.

(7) Assimilative capacity has been allocated to the proposed discharge consistent with the classification set forth in Appendix F of these rules.

Permit limits based upon the acute and chronic criteria for aluminum are included in the permit. Permitting the full assimilative capacity of the receiving water for aluminum on a short-term basis is necessary to address the phosphorus impairment.

(8) The discharge of wastes to the thermocline or hypolimnion of any lake in manner that may prevent the full support of uses is prohibited.

Permit limits for aluminum and turbidity are established to maintain full support of uses in the hypolimnion of Lake Carmi.

(9) The discharge of sewage into Class B(1) or B(2) waters shall not pose more than a negligible risk to public health. Compliance with this criterion shall include an assessment of both the level and reliability of treatment achieved and the impact of the discharge on the water quality of the receiving waters.

Not Applicable.

B. Antidegradation

Federal regulations found at 40 CFR § 131.12 require states to develop and adopt a statewide antidegradation policy that maintains and protects existing in-stream water uses and the level of water quality necessary to protect these existing uses. Vermont's statewide antidegradation policy is found in the Vermont Water Quality Standards Section 29A-105. Guidance for the implementation of this policy is in the 2010 Interim Antidegradation Implementation Procedure.

The Secretary applies the Antidegradation Policy and Procedure during the review of applications for a new discharge under an individual NPDES direct discharge permit issued pursuant to 10 V.S.A. §1263 and the Vermont Water Pollution Control Permit Regulations, as in this case.

Under the Procedure, the Secretary must first determine the applicable water quality review Tier:

Tier 3 - Protection of water quality in outstanding resource waters
Tier 2 - Protection and maintenance of water quality in high quality waters
Tier 1 - Determination and protection of existing uses

Tier 3: Lake Carmi is not designated as an Outstanding Resource Waters in the 2022 VWQS.

Tier 2: Requires the Secretary to determine:

(1) whether the proposed discharge will result in a limited reduction in water quality; and
(2) after an analysis of alternatives, any limited reduction in water quality satisfies the socioeconomic justification test set forth in the Procedure.

1. Limited Reduction in Water Quality.

Lake Carmi (1,375-ac) is a relatively shallow lake (maximum depth = 33 ft, mean depth = 20 ft) that has a history of late summer algae blooms. The Franklin Watershed Committee was formed in 1994 to investigate and address sources of phosphorus to the lake. During the summer of 2006 and 2007, algae blooms tested positive for cyanobacteria. Cyanobacteria are known to produce toxins. In 2008, the Department of

Environmental Conservation (DEC) listed Lake Carmi as “impaired” by phosphorus and per CWA Section 303(d), prepared a Total Maximum Daily Load analysis.

The TMDL defined 22 parts per billion (ppb) as the target concentration. The Lake Carmi Phosphorus Reduction Action Plan identified projects that, once implemented, were expected to result in the lake meeting its in-lake phosphorus concentration of 22 ppb. From 2008 to 2023, watershed and in-lake management activities have been implemented, including installation of a state-of-the-art contained wastewater treatment system within the Lake Carmi State Park, Best Management Practices (BMPs) at shoreline properties and farms in the watershed, ditch/stream bank stabilization projects, installation of the aeration system in 2019, and aquatic plant harvesting. These activities have not reduced the mass of internal phosphorus loading to Lake Carmi and the July 2024 Lake Carmi Feasibility Study on the Inactivation of Phosphorus in Lake Bottom Sediments states, current cyanobacteria blooms are largely a consequence of internal phosphorus loading and nitrogen limiting conditions. From modeling and experimental data, internal phosphorus loading is 71% of the total phosphorus loads to Lake Carmi.

The applicant provided an analysis of alternatives that considered the approaches described below to address internal phosphorus loading.

a. Additional Watershed Controls Alone – This alternative will not result in measurable improvements in lake water quality. Continued watershed control will extend the life of an alum treatment.

b. Aeration – This alternative did not reduce the mass of internal phosphorus loading to Lake Carmi. Without aeration, the internal phosphorus loading in 2018 was 3,073 pounds and with aeration, the internal phosphorus loading in 2022 was 3,638 pounds.

c. Dredging and construction and operation of an inflow alum treatment facility – This alternative was determined not to be a cost-effective approach to improve clarity and water quality. Given the depth of phosphorus enrichment in Lake Carmi, a dredging depth of 20 centimeters or greater would be required. This would cost an estimated minimum of 11 million dollars and take multiple years to complete, causing an ongoing disturbance to recreational users.

d. Hydrogen Peroxide Treatment – This alternative would be impractical for the size of Lake Carmi. Several tanker trucks of chemical would be required and mobilizing that large volume of chemical requires planning and quick mobilization to capture a bloom is unlikely. Several simultaneously operating barges would be needed and after treatment, the dead algae would sink to the sediment, further enriching the sediment and not solving the problem of internal phosphorus loading.

e. Alum treatment – This approach was selected as the applicant’s preferred method of addressing internal phosphorus loading. The treatment will improve water quality by inactivating phosphorus in the bottom sediments. It is expected that the alum treatment will last 10-30 years. Phosphorus inactivation is the typical choice for controlling internal phosphorus loading in recreational lakes.

2. Socioeconomic Justification Test

A limited reduction in the existing higher quality of high-quality waters only when it is shown that:

i. the adverse economic or social impacts on the people of the state specifically resulting from the maintenance of the higher quality waters would be substantial and widespread;
ii. these adverse impacts would exceed the environmental, economic, social and other benefits of maintaining the higher water quality; and
iii. there shall be achieved the highest statutory and regulatory requirements for all new or existing point sources, and all cost effective and reasonable accepted agricultural practices and best management practices, as appropriate for nonpoint source control, consistent with state law.

The Secretary proposes this discharge meets the socioeconomic justification criteria as follows:

i. Lake Carmi is a popular destination for anglers, birders, boaters and campers. In addition to homes around the lake, Lake Carmi State Park offers 173 campsites as well as a boat launch, day-use picnic area, swimming beach and walking trails. The authorization of this alum treatment is intended to protect the recreational uses of Lake Carmi while reducing internal phosphorus cycling and prolonged cyanobacteria blooms. Addressing internal phosphorus loading will avoid significant adverse socioeconomic impacts due to prolonged cyanobacteria blooms that have resulted in extended closure of beaches and the inability to recreate on the lake for the majority of Vermont's short summer season.

ii. This permit authorizes a one-time alum treatment from September 15, 2025 – November 30, 2025 to address phosphorus impairment and mitigate impacts of cyanobacteria blooms on the designated uses. Any temporary impacts resulting from the treatment outweigh the value of controlling internal phosphorus cycling and cyanobacteria blooms documented in Lake Carmi.

iii. Permit limits and conditions are provided to implement the highest statutory and regulatory requirements for the discharge.

In summary, the Secretary concludes that the proposed permit satisfies the Antidegradation Policy in the Vermont Water Quality Standards.

VIII. Summary of Monitoring Points

Monitoring points are divided into different locations to allow for efficient compliance reporting:

1. S/N 001-S/N 004 = Monitoring of the volume and concentration of aluminum-containing chemicals discharged during application from each of the treatment barges.

2. Water Column Monitoring Points = aluminum monitoring in the centroid of the area treated that day with composite samples collected at 1-meter intervals at 1-meter intervals starting at 1 meter below the surface and ending 1 meter above the lake bottom.

3. One Meter Below Water Surface Monitoring Points = Compliance monitoring in the centroid of the area treated that day using grab samples collected at 1 meter below the water surface.

4. Near Bottom Monitoring Points = Compliance monitoring in the centroid of the area treated that day using grab samples collected at 1 meter above the sediment surface.

5. Post-Treatment One Meter Below Water Surface Monitoring Points = Compliance monitoring one week following completion of all alum applications at 10 points in the lake using grab samples collected at 1 meter below the water surface.

6. Post-Treatment Near Bottom Monitoring Points = Compliance monitoring one week following completion of all alum applications at 10 points in the lake using grab samples collected at 1 meter above the sediment surface.

7. Post-Treatment Outlet Monitoring Point = Compliance monitoring following completion of all alum applications weekly until 11/30/25 and monthly from 4/1/26 to 11/30/26 at the outlet before the dam and Mill Pond using grab samples collected at the water surface. This monitoring shall continue for the duration of the permit term.

IX. Permit Basis and Explanation of Limitation Derivation (S/N 001-S/N 004)

A. Flow – The draft permit requires continuous measurement of flow from the treatment system barges to quantify the amount of aluminum discharged to the lake. Daily Maximum Flow and Monthly Average Flow are to be reported. Monthly average flow shall be calculated by summing the daily discharged flow of aluminum sulfate and sodium aluminate for each day in the given month and dividing the sum by the number of days of discharge in that month.

B. Aluminum – Calculation of the applied treatment aluminum concentration is required daily when discharge is occurring. The permit requires the application of alum be controlled such that the discharge meets the water column monitoring permit limits for aluminum. Daily Maximum and Monthly Average concentrations are to be reported.

X. Permit Basis and Explanation of Limit Derivation (Water Column Monitoring)

Following each day's alum application and the next morning, the Permittee shall collect composite samples comprised of samples taken at 1-meter intervals starting at 1 meter below the surface and ending 1 meter above the lake bottom in each zone treated that day.

A. Aluminum – Aluminum is considered a non-essential metal because fish and other aquatic life don't need it to function. Elevated levels of aluminum can affect some species' ability to regulate ions, like salts, and inhibit respiratory functions. The 2022 Vermont Water Quality Standards include the US EPA Aluminum Criteria.

Monitoring is required daily, after treatment and the following morning, in the sectors where discharge is occurring. The permit requires the application of alum be controlled such that the discharge meets the permit limit for aluminum.

Given the challenge of assessing where in the water column aluminum may be highest at a given time as the alum settles, compliance with the aluminum criteria will be assessed using depth-integrated composite samples. Aluminum concentrations will not be elevated at a particular depth for a significant period of time, and composite sampling will capture conditions throughout the water column after the alum treatment. Therefore, composite samples shall be collected at 1-meter intervals starting at 1 meter below the surface and ending 1 meter above the lake bottom.

XI. Permit Basis and Explanation of Limitation Derivation (1 Meter Below Surface and Near Bottom Monitoring)

Following each day's alum application, the Permittee shall collect and analyze samples 1 meter below the lake surface at the centroid of each area treated that day.

Following each day's alum application, the Permittee shall collect and analyze samples 1 meter above the sediment surface of the lake at the centroid of each area treated that day.

A. pH – A monitor only condition for pH has been included in the draft permit. The 2018 USEPA Aluminum Criteria calculation methodology requires inputs of total hardness, pH, and DOC to determine the applicable water quality criteria in a receiving water. Sampling shall occur daily, following all alum application that day.

B. Turbidity – The turbidity limit is 25 NTU, expressed as an annual average under dry weather, base-flow conditions, as described in Special Condition I.A.7.h. If sampling indicates the discharge has exceeded the permitted limit, the discharge must be discontinued until samples are meeting the permitted limit. Sampling shall occur daily, following all alum application that day.

C. **Temperature** – A monitor only condition for Temperature has been included in the draft permit. Along with pH, temperature provides basic information helpful in interpreting chemical data. Sampling shall occur daily, following all alum application that day.

D. **Dissolved Organic Carbon (DOC)** – DOC is organic matter contained in a water sample that is soluble and/or colloidal and can pass through a 0.45-µm filter. The 2018 USEPA Aluminum Criteria calculation methodology requires inputs of total hardness, pH, and DOC to determine the applicable water quality criteria in a receiving water. Sampling shall occur daily, following all alum application that day.

E. **Total Hardness** – Total Hardness is required to obtain a measurement of alkalinity, a necessary parameter in determining the aluminum criteria. Sampling shall occur daily, following all alum application that day.

F. **Aluminum** – Aluminum is considered a non-essential metal because fish and other aquatic life don't need it to function. Elevated levels of aluminum can affect some species' ability to regulate ions, like salts, and inhibit respiratory functions. The US EPA promulgated Aluminum Criteria in 2018 and these criteria are incorporated into Vermont's Water Quality Standards. Sampling shall occur daily, following all alum application that day.

XII. Permit Basis and Explanation of Limitation Derivation (Post-Treatment Monitoring)

One week following application of alum treatment, monitoring at one meter below the water surface and one meter above sediment is required in 10 locations in the lake to monitor the impacts of the alum treatment. A map of the sample locations with approximate latitude and longitude is included as Attachment A of the permit.

Following application of the alum treatment and until 11/30/25, monitoring is required weekly at the outlet of the lake before the dam and Mill Pond. The Permittee shall notify the Secretary if ice buildup in the lake prevents sampling in late November. Monthly monitoring is required 4/1/26 to 11/30/26. Because Lake Carmi, like many lakes, experience water temperature-driven turnover in spring and fall, this monitoring is intended to track the long-term impacts of alum treatment.

A. **Aluminum** – Aluminum is considered a non-essential metal because fish and other aquatic life don't need it to function. Elevated levels of aluminum can affect some species' ability to regulate ions, like salts, and inhibit respiratory functions. The US EPA promulgated aluminum Criteria in 2018 and these criteria are incorporated into Vermont's 2022 Water Quality Standards. This data will determine if aluminum levels in the lake remain elevated following alum treatment, and if seasonal lake turnover contributes to aluminum at the outlet.

B. pH – A monitor only condition for pH has been included in the draft permit. The 2018 USEPA Aluminum Criteria calculation methodology requires inputs of total hardness, pH, and DOC to determine the applicable water quality criteria in a receiving water.

C. Turbidity – The turbidity limit is 25 NTU, expressed as an annual average under dry weather, base-flow conditions, as described in Special Condition I.A.7.h.

D. Temperature – A monitor only condition for Temperature has been included in the draft permit. Along with pH, temperature provides basic information helpful in interpreting chemical data.

E. Dissolved Organic Carbon (DOC) – DOC is organic matter contained in a water sample that is soluble and/or colloidal and can pass through a 0.45-µm filter. The 2018 USEPA Aluminum Criteria calculation methodology requires inputs of total hardness, pH, and DOC to determine the applicable water quality criteria in a receiving water.

F. Total Hardness – Total Hardness is required to obtain a measurement of alkalinity, a necessary parameter in determining the aluminum criteria.

G. Phosphorus – A monitor only condition for Phosphorus has been included in the draft permit to provide information on the reduction of phosphorus in the lake and outlet as a result of the alum treatment.

XIII. Special Conditions

1. As part of the application for a discharge permit the permittee submitted a plan to apply alum to Lake Carmi in a manner that assures compliance with the VWQS for aluminum. The permit requires implementation of this plan as written and submitted to the Secretary on May 7, 2025.

2. To inform residents and lake users of the treatment, the permit requires that notification and postings at public access areas be made at least 1 week in advance of treatment. The permittee shall also provide a point of contact for the public to ask questions and report impacts or concerns during the aluminum application. The permittee shall submit to the Secretary any such reports within 24 hours of receipt using the WSMD Generic Submission form, or alternative online submission form as directed, and maintain a log of all complaints and concerns to be provided as an attachment to the monthly eDMR reporting. Attachment B includes guidance for the WSMD Generic Submission form.

3. Notification of application commencement, application postponement, and application completion shall be electronically submitted to the Secretary within one day of the event using the WSMD Generic Submission form or alternative online submission form as directed. Attachment B includes guidance for the WSMD Generic Submission form.

4. Alum application shall not occur if the National Oceanic Atmospheric Administration (NOAA) National Weather Service forecasts sustained winds of 15 mph or higher shall occur on the day of application or a significant precipitation event (greater than 1 inch in 24 hours) shall occur during treatment or begin within 24 hours after treatment completion. Application shall be postponed until conditions conform to these requirements.

5. Before application each day the permittee must monitor pH at least 1 meter below the surface in the zone to be treated to ensure the permit's aluminum limits are sufficiently protective on the day of treatment. Vermont DEC reviewed observed pH conditions in Lake Carmi and the corresponding calculated aluminum criteria. Based on that review, the permit's aluminum limits will be sufficiently protective in the pH range of 7.2 to 9.5. Application may not commence unless pH is confirmed to be within 7.2 and 9.5.

6. Following treatment each day in the treatment zone and the following morning in the treatment zone completed the previous day, a qualitative observation of the floc formation from the surface shall be completed with a photo record. The photo record shall be attached to the monthly eDMR reporting.

7. The permittee shall maintain logs of the aluminum concentration and the volume of treatment chemicals added daily, these and all data sheets generated during treatment shall be submitted monthly as attachment to the eDMR reporting

8. The discharge of treatment chemicals may not violate permit conditions. Violation of permit conditions shall require that the Permittee immediately cease treatment operations and remediate the violations. Treatment may not be restarted unless the Secretary has approved the recommencement of alum application.

9. If there are signs of an algal bloom on the day of treatment, the Permittee shall contact the DEC Lakes and Ponds Program before proceeding with the application.

10. Operation, Maintenance and Emergency Response Plan (OMERP) – The Permittee shall be required to prepare a plan that identifies portions of their treatment system that could negatively impact water quality if an equipment failure were to occur and cause the release of treatment chemicals to the lake or lakeshore. This plan shall be submitted to the Secretary for review and approval and shall include dosing plan specifics and measures to mitigate any violations of the Vermont Water Quality Standards. Those measures shall include, at a minimum, a method to correct any exceedances of pH, any exceedances of turbidity, and a method to remove excess aluminum from the water column. All equipment, supplies and personnel required to implement the plan must be on-site.

11. Water Quality Violation Monitoring – A water quality professional is required to conduct a continuous survey of the lake, outlet and surrounding shoreline during the application of treatment chemicals. Observational monitoring must continue during daylight hours for 48 hours following the completion of aluminum application. In the

event that any impacts to any biota are observed or reported to either the Permittee or the survey staff, all treatment operations must cease and the appropriate sections of the OMERP implemented. No discharge is allowed in the absence of these monitors.

XIV. Reasonable Potential Analysis

The Agency has conducted a limited reasonable potential analysis for this discharge based on the composition of the discharge. The decision is attached to this Fact Sheet as Attachment A.

XV. Procedures for Formulation of Final Decision

The public comment period for receiving comments on the Draft Permit was from June 3, 2025 through July 3, 2025. One written comment was received, and the permit language was modified in response. A copy of the comment and the response are attached as Attachment C.

Final Action/Right to Appeal to the Environmental Division of the Superior Court
Pursuant to 10 V.S.A. § 8504 (amended effective January 1, 2018), an aggrieved person shall not appeal the final determination on the draft permit unless the person submitted to ANR a written comment during the applicable public comment period or an oral comment at the public hearing conducted by ANR. Absent a determination of the Environmental judge to the contrary, an aggrieved person may only appeal issues related to the person's comments to ANR as prescribed by 10 V.S.A. § 8504(d)(2).

Pursuant to 10 V.S.A. Chapter 220 and the Vermont Rules for Environmental Court Proceedings, any appeal of this permit or an authorization made pursuant to this permit, except for an appeal of a permit for a renewable energy plant, must be filed with the clerk of the Environmental Division of the Superior Court within 30 days of the date of the decision. The address for the Vermont Environmental Court is: Vermont Superior Court, Environmental Division, 32 Cherry Street, 2nd Floor, Suite 303, Burlington VT 05401 (Tel. (802) 951-1740). For further information, see the Vermont Rules for Environmental Court Proceedings, available online at www.vermontjudiciary.org.

The notice of appeal must specify the parties taking the appeal and the statutory provision under which each party claims party status; must designate the act or decision appealed from; must name the Environmental Division; and must be signed by the appellant or the appellant's attorney. In addition, the appeal must give the address or location and description of the property, project, or facility with which the appeal is concerned and the name of the applicant or any permit involved in the appeal. The appellant must also serve a copy of the notice of appeal in accordance with Rule 5(b)(4)(B) of the Vermont Rules for Environmental Court Proceedings. For further information, see the Vermont Rules for Environmental Court Proceedings.

If the determination relates to a renewable energy plant for which a certificate of public good is required under 30 V.S.A. § 248, any appeal of such determination must be filed with the Vermont Public Utility Commission pursuant to 10 V.S.A. §

8506. Section 8506 does not apply to a facility that is subject to 10 V.S.A. § 1004 (dams before the Federal Energy Regulatory Commission), 10 V.S.A. § 1006 (certification of hydroelectric projects), or 10 V.S.A. Chapter 43 (dams). Any appeal under Section 8506 must be filed with the clerk of the Public Utility Commission within 30 days of the date of this decision; the appellant must file with the clerk an original and six copies of its appeal. The appellant shall provide notice of the filing of an appeal in accordance with 10 V.S.A. § 8504(c)(2) and shall also serve a copy of the notice of appeal on the Vermont Public Service Department. For further information, see the Rules and General Orders of the Public Utility Commission.

Attachment A – Reasonable Potential Determination Memorandum

The Vermont Water Quality Standards (VWQS) define numeric and narrative criteria for Vermont surface waters, and these criteria are the basis for water quality-based effluent and receiving water limits in Vermont DEC's direct discharge permits. This memo lists the pollutants of concern identified for the proposed alum treatment at Lake Carmi in Fall 2025, describes their corresponding criteria in the VWQS, and provides implementation guidance to ensure that the discharge will be supportive of designated uses.

Water Quality Classifications and Fish Habitat Designation

Appendix F of the VWQS lists the water quality classification for all waters based on each designated use, and these classifications often determine which numeric and narrative criteria apply to the waterbody. Lake Carmi is considered Class B(2) for all uses.

Fish habitat designations, which are listed in Appendix A of the VWQS, also affect certain criteria applicable to each waterbody. The VWQS define Lake Carmi as a Warm Water Fish Habitat.

For some pollutants, the presence of Rare, Threatened, or Endangered (RTE) species informs the development of water quality criteria. Vermont Fish & Wildlife, which provided input at the Wastewater Program's request, did not identify any RTE species that may be impacted by the proposed alum treatment in Lake Carmi.

Water Quality Criteria

Based on information submitted by the applicant, DEC has identified turbidity, settleable solids, suspended solids, color, pH, and aluminum as possible pollutants of concern resulting from the proposed alum treatment.

- Turbidity (VWQS § 29A-302(4)(B)): The turbidity criterion for Class B waters designated as warm water fish habitats is "not to exceed 25 NTU [nephelometric turbidity units] as an annual average under dry weather base-flow conditions." Given that the proposed alum treatment will occur over only a few weeks, DEC does not expect the discharge to contribute to an exceedance of this criterion, but recommends turbidity monitoring be required during and after treatment to provide data on any short-term impacts to the receiving water.

- Settleable solids, total suspended solids, and color (VWQS § 29A-303): The narrative criterion for settleable solids and total suspended solids is "none in such concentrations or combinations that would prevent the full support of uses." Similarly, the narrative criterion for color is "no change from the natural condition that would prevent the full support of uses." There is potential for the proposed alum treatment to temporarily impact aesthetic and recreational uses as a result of settleable solids, suspended solids, or color during the treatment, as the alum is applied and settles to the lake bottom. However, any impacts are expected to be short-lived and, furthermore, the applicant's goal for the treatment is to ensure long-term support of aesthetic and recreational uses that are at

risk due to frequent harmful algal blooms. DEC recommends that the permit require receiving water observations to document any visible solids or color changes during treatment and to ensure that these narrative criteria are met within 48 hours after alum application in each treatment segment.

- pH (VWQS § 29A-303(6)): The criterion requires that pH "be maintained within the range of 6.5 and 8.5. Both the change and the rate of change in pH values shall be controlled to ensure the full support of uses." This criterion applies at all times before, during, and after the proposed alum treatment.

- Toxicity (VWQS § 29A-303(7)(A)(iii): The general toxic substances criteria require that waters be managed "to prevent the discharge of toxic substances in concentrations, quantities, or combinations that exceed… acute or chronic toxicity to aquatic biota or wildlife." Aluminum is the only toxic pollutant of concern identified for the proposed alum treatment and DEC therefore expects that setting effluent limits based on the VWQS aluminum criteria (described below) will ensure that the narrative toxicity criterion is also met.

- Aluminum (VWQS § 29A-303(7)(C)(ii)): Appendix C of the VWQS specifies criteria for toxic substances, including aluminum. As stated in § 29A-303(7)(C)(ii), these aquatic biota-based criteria apply at all times in Lake Carmi.

  DEC followed the methodology outlined in Vermont's *Implementation Procedure for the 2018 Aquatic Life Water Quality Criteria for Aluminum* (Implementation Procedure) to develop acute and chronic aluminum criteria for the proposed discharge. The Implementation Procedure specifies that concurrent ambient water chemistry data for pH, dissolved organic carbon (DOC), and total hardness should be used to calculate instantaneous receiving water (in this case, pre-treatment) aluminum criteria using the Environmental Protection Agency's (EPA's) Aluminum Criteria Calculator. The Implementation Procedure also requires a minimum of 12 sample dates representing a range of spatial and temporal conditions be included in the analysis and that the 5th or 10th percentile, depending on the presence RTE species, of calculated instantaneous criteria be selected for the final compliance values. This process is intended to result in aluminum criteria that are protective of aquatic life under critical receiving water conditions.

  To develop criteria, DEC reviewed all available water chemistry data for Lake Carmi (Site 503512 in the Integrated Watershed Information System). The Implementation Procedure specifies that only samples that include concurrent results for pH, DOC, and total hardness may be used for calculating criteria. Based on this requirement, DEC included 38 water chemistry samples spanning the years 2018 through 2024, collected at either 1 meter or 8 meters depth, in its analysis. The depth variability of the samples is important, as water chemistry changes with lake depth and criteria based on near-surface conditions may not be sufficiently protective of aquatic life at the bottom of the lake. For this project, data from the fall months (September through November) is likely to be most representative of the range of potential conditions; data from other months was excluded for this reason. Vermont Fish and Wildlife did not identify any RTE species in Lake Carmi

that would warrant additional protection for the permitting of the alum treatment, therefore the 10th percentile of calculated acute and chronic criteria, 1600 µg/L and 590 µg/L, were selected as the final values. An aluminum calculation spreadsheet is available on request.

Mixing Zone

§ 29A-204(1) of the VWQS facilitates the creation of mixing zones in Class B waters not exceeding 200 feet from the point of discharge. Within the mixing zone, specified water quality criteria may be exceeded, provided that all criteria are met outside of the mixing zone. Additionally, conditions within the mixing zone must meet the requirements listed in § 29A-204(2).

Treatment data provided by the applicant indicates that the discharge will require a mixing zone to comply with the aluminum criteria. This is a unique mixing zone for a discharge permit, as the discharge point is located on a moving barge and the mixing zone will therefore move within the treatment area over time. Aluminum concentrations are also expected to vary over time and depth as the alum flocculates and settles, so the criteria will likely be exceeded in only a portion of the water column at a given time. Based on the applicant's description of expected lake conditions during the treatment, and after consulting with the Lakes and Ponds Program on mixing dynamics in Lake Carmi, DEC proposes allowing an aluminum mixing zone the depth of the water column (33 feet at the lake's deepest point) and 200 feet in all lateral directions from the discharge.

No mixing zone should be granted for the other pollutants of concern identified above.

ATTACHMENT B – GENERAL INTAKE FORM GUIDANCE

VERMONT

Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Davis 3
Montpelier, Vermont 05620-3522
https://dec.vermont.gov/watershed

Agency of Natural Resources

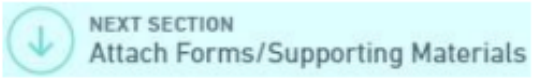
[phone] 802-828-1115

Wastewater Schedule Item Submittal Guidance

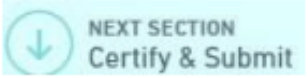
How to submit Schedule item documents associated with; Wastewater permits, 1272 orders, AODs and NOAVs

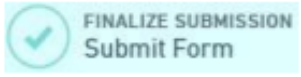
To start, visit: the WSMD Generic Submission form: https://anronline.vermont.gov/?formtag=WSMD_Intake

1. Scroll to the bottom of the page and click the 

button.
2. Log in to an account, sign up for an account, or continue as a guest user.
3. Fill out each field in the General Information Section.
   - Type the name of the contact person, phone, and email address.
   - Select the Watershed Management Division Program of either:
     - "Wastewater Direct Discharge" OR
     - "Pretreatment Discharge"
   - Select "Compliance or reporting form" as the submission type.
   - Enter Permit number
   - Click the 

button at the bottom of the page.
4. Click "Choose File" and select your compliance notifications.
   - Click the 

button at the bottom of the page.
5. Review your data.
   - Click the 

button at the bottom of the page.
   - Click the 

button at the bottom of the page.

Note: the form will accept documents up to 100 MB (100,000 KB). If you have very large files, first try zipping the files. If they are still too large, contact Mari.Cato@vermont.gov.

As of July 1, 2025, the Wastewater program will no longer accept schedule items via email or USPS mail.

ATTACHMENT C – RESPONSIVENESS SUMMARY

NPDES Discharge Permit No. 3-1588
Town of Franklin
Lake Carmi Alum Treatment

The Vermont Agency of Natural Resources (Agency) placed the above referenced permit on public notice initially from June 3, 2025 to July 3, 2025.
One comment on the draft permit was received during the public notice period. The following is the comment and the Agency's response.

COMMENT 1:

This comment is being submitted by Barr Engineering with respect to draft NPDES permit No. 3-1588 and the pH monitoring procedures identified in Section I.A, Table 3, One Meter Below Water Surface Monitoring Points. The pH monitoring Limit 2 of 8.5 has been often historically and naturally exceeded in the surface of Lake Carmi during the expected treatment period of September and October. For example, on September 28, 2017, a pH of 8.5 was exceeded in the top 4 meters of Lake Carmi. The depth-averaged pH on this same date was 8.0. pH was also above 8.5 in the surface waters in September 2018 and 2020. Note that the operation of the aerator likely reduced surface pH in the years it was operational, and it can be expected that surface pH in 2025 will be similar to years such as 2017 as the aeration system is no longer operational. Treatment may be significantly delayed if pH compliance is judged solely by surface water measurements.

We are requesting that pH measurements in Table 3 be taken as 1-meter depth profiles and compliance with permit limits of 6.5 to 8.5 be based upon a depth-averaged pH calculation. It is requested that this pH monitoring requirement be moved to Table 2. This will facilitate the evaluation of the average water column pH at the end of treatment and prior to treatment start each treatment day. Alternatively, the pH requirement could be a separate table with frequency, timing, and location being the same as Table 3.

RESPONSE:
Vermont DEC's intent in setting pH limitations for the Lake Carmi alum treatment was to ensure that (1) the alum treatment would not significantly alter lake pH levels, and (2) the permit's aluminum limits were sufficiently protective on the day of treatment, as pH impacts aluminum toxicity. The draft limits required that pH be maintained within the range of 6.5 to 8.5, reflecting the pH criteria defined in Section 29A-303(6) of the Vermont Water Quality Standards (VWQS).

While these pH limits are appropriate for most lakes, after reviewing available data from Lake Carmi, DEC concurs with Barr Engineering that the upper limit of 8.5 should not apply to Lake Carmi. Cyanobacteria blooms often cause elevated pH levels, and data collected by DEC's Lakes Program indicates that the pH at 1 meter depth is sporadically greater than 8.5, presumably when blooms are occurring. Furthermore, the pH at 8 meters depth has also occasionally exceeded 8.5. These measurements are not considered exceedances of the VWQS, as Section 29A-301 states that, "Waters in which one or more applicable water quality criteria are not met due to natural influences shall not be in noncompliance with respect to such criteria."

Rather than setting a depth-averaged pH limit as Barr Engineering requested, Vermont DEC removed the pH limitations in Section I.A Tables 3 through 7 and replaced them with requirements to monitor pH at the frequencies defined in the draft permit. This is appropriate for the following reasons:

- Section 29A-301 of the VWQS allows for permitted activities to occur in waters that do not meet water quality criteria due to natural influences, “provided that those activities do not further reduce the quality of the receiving waters and would comply with all other applicable criteria.” The permit requires the alum treatment to comply with other applicable criteria.
- Section I.A.8.b of the permit requires Barr Engineering to complete the alum treatment as described in its Technical Memorandum (Attachment B), which states that it will apply alum and sodium aluminate at a ratio that minimizes the changes in lake pH from existing conditions. The pH monitoring requirements will ensure that this condition is met.

To ensure that the permit’s aluminum limits are sufficiently protective on the day of treatment, Vermont DEC reviewed observed pH conditions in Lake Carmi and the corresponding calculated aluminum criteria. Based on that review, the permit’s aluminum limits will be sufficiently protective in the pH range of 7.2 to 9.5. Section I.A.8.f of the permit was modified to reflect this finding:

Prior to application each day, the Permittee shall monitor each zone to be treated for pH. Samples shall be taken 1 meter below the water surface in the centroid of the treatment area. Application shall not commence unless pH is confirmed to be within the range of 7.2 and 9.5.

Additionally, due to high pH values at Lake Carmi generally being the result of an active algal bloom, the following condition was added as Section I.A.8.o:

If there are signs of an algal bloom on the day of treatment, the Permittee shall contact the Department of Environmental Conservation (DEC) Lakes and Ponds Program before proceeding with application.